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EXAMINER	
LEUNG, JENNIFER A	

ART UNIT	PAPER NUMBER
1764	

DATE MAILED: 09/16/2004

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)
	09/661,516	JAMES ET AL.
	Examiner	Art Unit
	Jennifer A. Leung	1764

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *24 June 2004*.

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-11 and 13-18* is/are pending in the application.

4a) Of the above claim(s) *15-18* is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-11,13 and 14* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☒ Claim(s) *1-11 and 13-18* are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *24 June 2004* is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☐ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____.
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: _____.

DETAILED ACTION

Response to Amendment

1. Applicant's amendments submitted on April 16, 2004 and June 24, 2004 have been received and carefully considered. The changes made to the Specification and Drawings are acceptable. Claim 12 is cancelled. Claims 15-18 are withdrawn from consideration. Claims 1-11, 13 and 14 stand rejected.

Response to Arguments

2. Applicant's arguments with respect to the rejection of claims 1-3 and 7 under 35 U.S.C. 102(b) as being anticipated by Furuya et al. (JP 06-111838) and claims 4-6 and 8-14 under 35 U.S.C. 103(a) as being unpatentable over Furuya et al., either alone or in view of secondary prior art references, have been fully considered but they are not persuasive.

Beginning on page 15, third paragraph, Applicant argues,

> "Figure 12 and paragraph [0065] are directed towards the solid oxide fuel cell, in which hydrogen is converted to electricity.
>
> The present invention, on the other had, creates a serial cross flow geometry in the reformer, not the fuel cell, to convert feed gas to hydrogen.
>
> Thus, Furuya et al. does not disclose a reformer, used to convert feed gas to hydrogen, having serial cross flow geometry."

The Examiner respectfully disagrees. As written in the JPO machine translation previously supplied to Applicants, section [0065] recites (with emphasis added),

> "The combustion catalyst was formed in silicon substrates 56 and 58, and the reforming catalyst was formed in the silicon substrate 57. Like drawing 12, it pasted up by the direct pasting-up method and the laminating of each wafer was carried out so that the substrate 57 for a refining reaction and the substrate 56 for a catalyzed combustion reaction might intersect perpendicularly."

The "refining reaction" (a.k.a. reforming reaction) is indicated by equations (1) and (2), found on page 2 of Furuya et al. Thus, the apparatus as indicated in Figure 12 and paragraph [0065] clearly comprises a reformer, and not a fuel cell as argued by applicants, since the apparatus is used for catalyzing a reforming reaction of methane or methanol to produce hydrogen. Additionally, section [0066] recites (with emphasis added),

> "By considering as the structure where the upper and lower sides of the substrate 57 for a refining reaction serve as substrates 56 and 58 for intermediation combustion, the refining section of fuel gas can be heated to homogeneity. Moreover, the fuel gas entrance 62, the hydrogen content gas outlet 64 after refining and the heating gas entrance 61, and the outlet 63 were formed in the bottom and the topmost part of a laminated structure like drawing 14 for piping of each fluid."

Again, Figure 12 and paragraph [0066] clearly indicate that the apparatus comprises a reformer, and not a fuel cell as argued by applicants, since fuel gas that enters the apparatus via entrance 62 is converted to hydrogen gas that exits the apparatus via outlet 64. If Figure 12 were to comprise a fuel cell, we would instead observe the consumption of hydrogen gas to generate energy, and not the generation of hydrogen gas as presently shown. Additionally, Figure 12 would have to comprise an anode layer and a cathode layer in order to operate as a fuel cell, and such layers are not shown.

Beginning on page 16, third paragraph, Applicant argues,

> "... Cornelison does not disclose a reformer having serial cross flow as in the presently claimed invention. Further, as stated above, Furuya et al. similarly does not disclose the use of serial cross flow in a reformer used to convert feed gas to hydrogen. As such, the combination of Furuya et al. and Cornelison et al. does not describe a reformer having serial cross flow geometry used to convert feed gas to hydrogen."

The Examiner respectfully disagrees. The test for obviousness is not whether the features of a secondary reference may be bodily incorporated into the structure of the primary reference; nor

is it that the claimed invention must be expressly suggested in any one or all of the references. Rather, the test is what the combined teachings of the references would have suggested to those of ordinary skill in the art. See *In re Keller*, 642 F.2d 413, 208 USPQ 871 (CCPA 1981). In the instant case, the Cornelison reference is merely provided to illustrate the conventionality of using the instantly claimed superalloy and/or stainless steel materials as catalysts supports in the apparatus of Furuya et al. Hence, the Examiner maintains that it would have been obvious for one of ordinary skill in the art at the time the invention was made to use such materials as supports for the catalysts in Furuya et al. because the use of such catalyst support materials is well known in the art of catalysis, as supported by Cornelison.

Claim Rejections - 35 USC § 102

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

3. Claims 1-3 and 7 are rejected under 35 U.S.C. 102(b) as being anticipated by Furuya et al. (JP 06-111838).

Regarding claims 1 and 3, Furuya et al. (Abstract; Machine Translation; Figures) disclose a plate frame heat exchange reactor assembly comprising:

a plurality of header sheets (i.e., plates **2**; FIG. 1, 2), each having a plurality of manifold ports (i.e., shown as holes **25**, **28**, etc. of combustion plate **20** in FIG. 7; section [0034]-[0035]) and a heat transfer surface contained within a central region of each header sheet;

a plurality of interleaved sheets (i.e., plates **1**; FIG. 1, 2), one interleaved sheet **1** being located

between each adjacent pair of header sheets **2**, wherein each of said plurality of interleaved sheets **1** comprises a plurality of interleaved manifold ports (i.e., shown as holes **26**, **27**, etc. of reforming plate **22** in FIG. 7; section [0034]-[0035]);

one of said plurality of interleaved sheets **1** and an adjacent one of said plurality of header sheets **2** defines a cell (i.e., fluid passages **3**, **4** in FIG. 1, 2; or passages **21**, **23** in FIG. 7);

a feed gas inlet manifold port (i.e., as shown in FIG. 7, port **27** functions as the feed gas inlet to reforming plate **22**; section [0034]-[0035]);

a burner feed inlet manifold port (i.e., as shown in FIG. 7, a port -- not illustrated -- located upstream of channels **21** functions as the burner feed inlet to combustion plate **20**; section [0034]-[0035]);

a reformer section (i.e., within a first reforming machine **42**; FIG. 8; section [0040]-[0043]) having a plurality of reformer channels (i.e., passages **3** comprise a thin layer of reforming catalyst **6**, FIG. 1, 2; shown as passages **23** in FIG. 7) being coupled to the feed gas inlet manifold port **27**, each channel being formed between every other cell, wherein each reformer channel **3** is coupled to an adjacent reformer channel **3** through at least one of said plurality of manifold ports and interleaved manifold ports (i.e., as shown in FIG. 7, reformer channels **23** of plate **22** coupled to adjacent reformer channels of plate **22a**, **22b**, etc. via manifold ports **27**; section [0034]);

a burner gas section (i.e., within the first reforming machine **42**; FIG. 8; section [0040]-[0043]) having a plurality of burner channels (i.e., passages **4** comprising a thin layer of combustion catalyst **5**, FIG. 1, 2; shown as passages **21** in FIG. 7) being coupled to the burner feed inlet manifold port (i.e., the port -- not illustrated -- upstream of channels **21**;

FIG. 7), each burner channel **4** being formed between the other of every other cell, wherein each burner channel **4** is coupled to an adjacent burner channel **4** through one of said plurality of interleaved manifold ports and one of said plurality of manifold ports (i.e., as shown in FIG. 7, burner channels **21** of plate **20** coupled to adjacent burner channels of plate **20a**, **20b**, etc. via manifold ports **25**; section [0034]);

an outlet manifold port coupled to said reformer section (i.e., as shown in FIG. 7, a port -- not illustrated -- located upstream of channels **23** functions as the outlet manifold for reformed gas produced in reforming plate **22**; section [0034]-[0035]); and

a burner outlet manifold port coupled to said burner section (i.e., as shown in FIG. 7, port **25** functions as the burner gas outlet from burner plate **20**; section [0034]-[0035]);

wherein the assembly may be configured for cross-flow with respect to the flow of feed gas and exhaust gas in the reformer and burner sections, or between a pair of adjacent cells (i.e., as shown in FIG. 12, reformer sections **57** having a substantially perpendicular flow to burner sections **56**, **58**; section [0065]).

Regarding claim 2, Furuya et al. further disclose a second inlet manifold port coupled to one of said reformer channels between one of said plurality of header sheets and one of said plurality of interleaved sheets (i.e., as shown in FIG. 7, a second inlet manifold port **27** inherently located in subsequent reforming plates **22a**, **22b**, etc., which feeds reformer channels **23**; section [0034]-[0035])

Regarding claim 7, Furuya et al. (FIG. 8, section [0040]-[0043]) further disclose a parallel zone interspersed within the assembly, the zone comprising:

at least one second reformer section coupled to a third inlet manifold port (i.e., a second

reforming machine **42**), the second reforming section having reforming channels and a feed gas inlet manifold structured similarly to the first reforming section discussed above (see comments made in claim 1);

at least one second burner gas section (i.e., within the second reforming machine **42**), the second burner gas section having burner channels and a burner feed inlet manifold structured similarly to the first burner section discussed above (see comments made in claim 1);

wherein the flow of the third stream of feed gas and the flow of the second stream of burner feed gas through the zone are substantially parallel, comprising either a co-flow or counterflow configuration with respect to one another (i.e., co-flow in FIG. 4, section [0029]; counterflow in FIG. 7, section [0034]-[0035]).

Instant claims 1-3 and 7 structurally read on the apparatus of Furuya et al.

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

4. Claims 6, 8-10, 13 and 14 are rejected under 35 U.S.C. 103(a) as being unpatentable over Furuya et al. (JP 06-111838).

Regarding claim 6, Furuya et al. disclose the plurality of plates for each of the header and interleaved sheets may comprise a material with a high thermal conductivity (such as metal), the plates each being "laminated" one on top of another (section [0016]-[0017]). Although Furuya et al. is silent as to the lamination being conducted by "brazing" metal plates together, it would have been obvious for one of ordinary skill in the art at the time the invention was made to select an appropriate lamination means, such as brazing, for plurality of plates in the apparatus for Furuya et al., since such lamination means is well known in the art.

Regarding claims 8-10, the same comments with respect to Furuya et al. apply (see comments in claims 1-3 above; see also FIG. 16, 18 and sections [0085]-[0086]). Furuya et al. further disclose the assembly may exhibit a flow configuration wherein,

the feed gas flow in the coupled reformer channel and the burner gas flow in the next adjacent coupled burner channel are substantially perpendicular with respect to one another (i.e., feed gas flowing from inlet **d** to outlet **h** in reformer plate **122** flows perpendicular to the burner gas flowing from inlet **e/f** to outlet **a** of burner plate **121**;

the feed gas flow in the coupled reformer channel and the feed gas flow in a next adjacent coupled reformer channel flows in opposite directions with respect to one another (i.e., the feed gas flows from inlet **d** to outlet **h** via the channels of reformer plate **122**, and the feed gas flows from inlet **h** to outlet **c** via the channels of reformer plate **120**; and

the feed gas flow and the exhaust gas flow are substantially cross-flow with respect to one another in the reformer and burner sections (see FIG. 16, 18).

Furuya et al. are silent as to whether the burner gas flow in the coupled burner channel and a next adjacent of coupled burner channel may flow in opposite directions with respect to one another (i.e., instead, Furuya et al. discloses the gas flow in the channels of burner plates **121** being co-flow; FIG. 18). In any event, it would have been obvious for one of ordinary skill in the art at the time the invention was made to select an appropriate flow direction in the respective burner channels in the apparatus of Furuya et al., on the basis of suitability for the intended use, because the rearrangement of inlets and outlets to achieve a desired flow configuration and/or temperature profile is conventional knowledge in the art of heat exchange, as evidenced by Furuya et al. (i.e., sections [0037]-[0038] teach the reconfiguration of holes **25**, **26**, **27** and **28** to achieve temperature equalization). Additionally, it has been held that where the general conditions of a claim are disclosed in the prior art, discovering the optimum or workable ranges involves only routine skill in the art, *In re Aller, 105 USPQ 233*.

Regarding claims 13 and 14, the same comments with respect to Furuya et al. apply (see comments in claims 6 and 7 above, respectively).

5. Claims 4, 5 and 11 are rejected under 35 U.S.C. 103(a) as being unpatentable over Furuya et al. (JP 06-111838) in view of Cornelison et al. (US 4,829,655).

Furuya et al. disclose the reforming **6** and combustion **5** catalysts (FIG. 1, 2) each comprise a dispersed catalytic metal (i.e., see sections [0019]-[0020]) on a layer of alumina (i.e., the use of γ-alumina being well known in the art of catalysis; see also sections [0022]-[0023]), the layer of alumina being adhered to a suitable structure, such as a plate with high thermal conductivity (i.e., a metal plate; section [0017]). Although Furuya et al. is silent as to the structure comprising a superalloy and/or stainless steel, it would have been obvious for one of

ordinary skill in the art at the time the invention was made to select an appropriate thermally conductive material (i.e., such as the instantly claimed materials) for the structure in the apparatus of Furuya et al., since the use of such materials for catalytic supports is well known in the art of catalysis, as evidenced by Cornelison (see column 2, lines 32-46). Additionally, the substitution of known equivalent structures involves only ordinary skill in the art. *In re Fout* 213 USPQ 532 (CCPA 1982); *In re Susi* 169 USPQ 423 (CCPA 1971); *In re Siebentritt* 152 USPQ 618 (CCPA 1967); *In re Ruff* 118 USPQ 343 (CCPA 1958).

Conclusion

6. **THIS ACTION IS MADE FINAL.** Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the mailing date of this final action.

* * *

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Jennifer A. Leung whose telephone number is (571) 272-1449. The examiner can normally be reached on 8:30 am - 5:30 pm M-F, every other Friday off.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Glenn A. Caldarola can be reached on (571) 272-1444. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

Jennifer A. Leung
September 13, 2004

Hien Tran

HIEN TRAN
PRIMARY EXAMINER